

CRUSTACEA.

PART IV.

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ISOPODA.

Part III.

In the following pages the remaining portion of the "Thetis" Isopoda is dealt with, including six members of the family Arcturidæ, five of which are described as new species; these are as follows:—

Arcturus simplicissimus.

„ *dentatus.*

„ *alcicornis.*

„ *nodosus.*

„ *serrulatus.*

The sixth species (*Arcturus oculatus*, Beddard) is new to the fauna of New South Wales, as the types were obtained by H.M. Ship "Challenger," off the entrance to Port Phillip, Victoria, at a depth of 33 fathoms.

The collection includes many other interesting members of the Suborder Isopoda, but these are unfortunately too imperfect to allow of description. In working out the material I have been seriously impeded by the paucity, imperfection, and extreme brittleness of the specimens; the latter feature I attribute to the action of the formaline used in their preservation, which appears to have affected the calcareous skeleton and rendered those parts brittle, whilst on the other hand the connecting tissues of the joints were hardened to such an extent that proper seriate dissection was extremely difficult.

While preparing this paper I have had occasion to overhaul the bottles containing the remainder of the "Thetis" Crustacea. I found that all the examples which had been left in the original formaline solution had seriously deteriorated; as far as their hard calcareous parts were concerned, they were rendered soft and like newly moulted crabs. Specimens that were removed from formaline to spirits, immediately after being preserved, were found in good condition.

Family ARCTURIDÆ.

ARCTURUS, Latreille.

Many of the species of the genus *Arcturus* are very similar in bodily contour and armature; the various appendages appear to afford the best characters whereby the species may be distinguished, and in this respect full use has been made of the relative length of the body segments, joints of the antennæ, and of the legs. A glance at the text and the accompanying figures will serve to show the value of the variation in the comparative length of joints of the larger limbs.

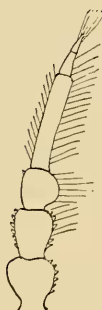
The position, number and character of the denticles or spines are also of importance. In some species the armature consists of a series of serrations; in others, of distinct spines, generally fixed, but occasionally mobile, especially near the extremities.

ARCTURUS SIMPLICISSIMUS, sp. nov.

(Figs. 114a-c.)

Station 57.

Adult male:—Body short, straight, and apparently without the usual power of flexure between the fourth and fifth segments of the peraeon. The superior surface is covered with a series of tubercles and ridges; the whole body, as well as the basal joints of the antennæ and legs, is more or less granulose; some of the granules are subspiniiform. The cephalon bears four short, broadly conical submedian spines—two on the frontal margin and two in a transverse line with the hinder border of the eyes. The segments of the peraeon bear a pair of low submedian tubercles, and also a lateral pair which tend to form longitudinal ridges. The segments of the pleon exhibit a few low tubercles on each side of the mesial line.



Second antennæ. slightly longer than the cephalon.

Fig. 114a. Eyes large, dark brown, prominent.

Inner antennæ very short, about equal in length to the first joints of the outer; first joint one-third longer than broad; second equal to the first, but much narrower; third joint about

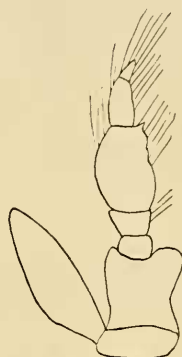
equal in length to the width of the second; fourth slender, tapering, and nearly twice as long as the third.

Outer antennæ short, not equal to the length of the cephalon and the three succeeding segments of the peraeon; first and second joints subequal, as broad or broader than long; third joint as long as the second, but narrower; fourth joint slender, nearly equal in length to the first and second combined; fifth joint twice as long as broad; sixth tapering to a point, and a little longer than broad. The inferior borders of the second to fourth joints are fringed with long setæ.

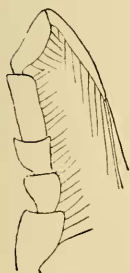
Mandibles stout, angularly bent above the middle, with a well defined molar tubercle, spine row, and a tridentate cutting edge.

The maxillipedes have a large lanceolate epipod; the palp is five-jointed; the first two are broader than long; the third is subovate, and bears a small spinule on its inner distal angle; fourth joint twice as long as broad; fifth minute and conical in shape.

First pair of legs short, stout; the second joint is twice as long as broad; third joint longer than broad and apically dilated; fourth joint nearly twice as broad as long; fifth as broad as long, increasing in diameter to the summit; sixth joint oblong, three times as long as broad; seventh joint much shorter than the sixth, slightly curved and tapering to an acute point.



Maxillipede.
Fig. 114b.



Second leg.
Fig. 114c.

Second joint of the second pair of legs one-fourth longer than broad; the third and fourth are equal, and as long as broad; the fifth and sixth are equal and nearly twice the length of the third; the upper border of the sixth joint is straight and the lower evenly curved; seventh joint slender, equal in length to the second, third, and fourth combined.

The inferior borders of the whole of the joints are sparsely setose; the setæ on the sixth and seventh joints are longer and stouter than those on the preceding joints.

The third and fourth pairs of legs have the second joint much longer, and the sixth somewhat shorter, than the corresponding joints of the second pair.

In the last three pairs of legs the second joints are subequal and about twice as long as the third, fourth or fifth; the sixth joint is slender and equal in length to the second; the seventh

is slightly curved at the extremity, and one-third shorter than the sixth.

The first pair of pleopods is elongate, and becomes somewhat wider as the setose apices are approached; the second pair is narrowly lanceolate; the outer ramus is acute at the apex; the inner is oblique-truncated, and bears a long slender stylet on its inner distal angle. Uropods acuminate smooth, with a few scattered hairs along the margins.

This species appears to be quite unique, the abbreviated joints of the antennæ, and the absence of adaptation for flexure of the body at the fourth and following segments of the peraeon, sharply define it from any species hitherto described.

Three examples of this species were obtained off Wata Mooli, in 54 to 59 fathoms.

ARCTURUS OCULATUS, *Beddard*.

Arcturus oculatus, Beddard, Chall. Rep., Zool., xvii., 1886, p. 102, pl. xxv., figs. 1-4.

Stations 37, 57.

Three examples of this well-marked species were obtained off Botany and Wata Mooli, in from 50 to 59 fathoms.

ARCTURUS DENTATUS, sp. nov.

(Figs. 115*a-c*.)

Station 37.

Adult female:—Body about 9 mm. long. Cephalon as long as broad; frontal margin slightly excavated; antero-lateral angles rounded; superior surface with four stoutish spines; the first pair are situated in a line with the anterior third of the eyes; the second pair are on the posterior border; their bases are wide and in a transverse line with the hinder portion of the ocular border. .

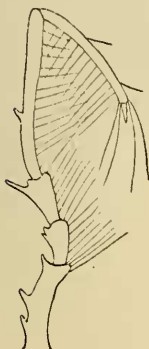
The first to the fifth segments of the peraeon are armed superiorly with three transverse rows of spines; of these the middle ones are the largest, especially those seated on the supero-lateral aspect of the body; the sixth and seventh have a single row of small spines and a few compressed denticles.

The pleon segments exhibit a few backwardly directed denticles; the caudal shield bears about four sublateral denticles on each side, the last pair being rather large; the extremity of the shield is obtusely pointed.

First pereopod segment nearly as long as the cephalon; second and third equal; fourth a little longer than the third.

Eyes rather large, but not prominent; colour blackish-brown.

First antennæ with the basal joint short and stout; second joint more than three times as long as broad; third twice as long as broad; fourth equal to the two preceding joints combined.



Second leg.
Fig. 115a.

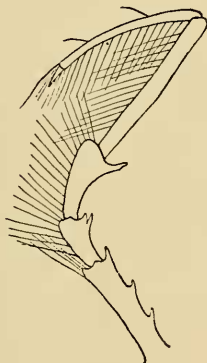
The first joint of the second antennæ is stout, and about 0.5 mm. in length; there are two small spines on the upper border; second joint 1 mm. long; the superior border carries six spines, three on each side of the median line; they are unequal in size, but at regular distances apart; third joint 3 mm. long, fourth 3.5 mm., fifth 1.2 mm., and the sixth 0.25 mm.; the distal extremities of the third and fourth joints are somewhat swollen.

Mandibles stout, straight, with a tridentate cutting edge, and a rather broad spine row; molar tubercle prominent, with an oblique apex.

Maxillipedes short; the epipod is rather large and broadly lanceolate; first and second joints of palp equal, and about as long as broad; third joint twice as long as broad; fourth joint one-third longer than broad; the length of the fifth equals the diameter of the fourth.

In the first pair of legs the third joint is nearly as long as the two following combined; sixth joint equal to the second, and nearly twice as long as the seventh.

Second joint of the second pair of legs four times longer than broad, with three spines on the superior border; third joint about twice as long as broad; the apical third is swollen, and there is a single spine on the superior border near the extremity; the fourth joint is one-third shorter than the second; it gradually increases in diameter distally, and terminates superiorly in a large projecting spine; fifth joint four times as long as the third, with one or two spines on the proximal half of the upper border; sixth joint a little shorter than the fifth; seventh very short, scarcely equal to the diameter of the preceding joint.



Fourth leg.
Fig. 115b.

The third and fourth pairs of legs differ from the second in having the second joints longer and the fifth shorter; the

spines on the former are much larger, and on the fifth joints they are absent.



Fifth leg.
Fig. 115c.

The second joint of the fifth pair of legs is equal in length to the three following combined; it has a well-marked spine at its inferior base; third joint equal to the sixth; fourth and fifth as long or slightly longer than broad; seventh stout, curved, and about one-tenth shorter than the sixth. The last two pairs of legs are smaller than the pair preceding; the second joints of each are provided with an inferior proximal spine. The pleopods are devoid of any special features. The uropods are lanceolate in shape, and each bears a series of about eight small denticles arranged in an oblique row.

Three specimens were obtained off Botany Bay, in 50 to 52 fathoms.

ARCTURUS ALCICORNIS, sp. nov.

(Figs. 116a-c.)

Station 37.

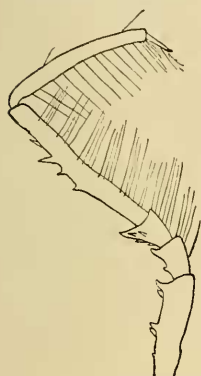
Adult female:—Body about 10 mm. long. The frontal margin of the cephalon is slightly excavated; the externo-lateral borders are produced, and bear three or four spines. There are two prominent spines on the frontal region; each has an accessory spine immediately below; the hinder border bears a pair of spines; these are submedian, and directed outwards; posterior to the eyes there are two obliquely placed spines on each side, and three similar spines occur on the postero-lateral margins.

The first segment of the peraeon is a little longer but not so wide as the cephalon; the second and third are subequal in length, and much wider than the first; the fourth is about a third longer than any of those preceding, and tapers rapidly to its rather narrow extremity; the fifth, sixth and seventh segments are very short mesially; the anterior and posterior borders are excavated and adapted to each other.

The armature of the peraeon is as follows:—The first segment bears a pair of submedian spinules; laterally there is a stoutish bifurcated spine on each side, and several spinules on lower margins. The second and third segments are each provided with four stout antler-like spines, two of which are lateral and two marginal; a few small spines occur at the posterior bases of the large branched spines, and several between the latter and the

median line of the body. The lateral surfaces of the fourth segment are covered with a series of small spinules; the fifth, sixth and seventh are laterally produced; there are submedian, lateral and marginal spines present, but they differ from those of the preceding segments in being short and conical; the armature of the pleon is somewhat similar, and the caudal shield has a pair of stout lateral spines which are situated nearer to the base than the obtusely rounded extremity; the surface carries six spines arranged in two submedian rows of three each; the lateral margins bear six small denticles; the subterminal portion of the shield is tumid, and when viewed from above is seen to be margined with about six small conical spines.

Eyes prominent; colour blackish-brown.



Third leg.
Fig. 116a.

Third joint a little longer and broader than the fourth; fifth joint as long as the narrow diameter of the fourth.

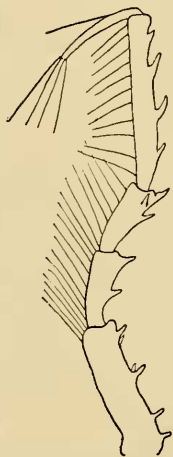
Third joint of the first pair of legs, with a well marked spine, situated at the distal third of the superior border; fourth and fifth joints equal in length; the inferior border of the former and the superior border of the latter are somewhat produced; sixth joint lanceolate in outline; seventh curved, and about one-third shorter than the sixth.

In the second to the fourth pairs of legs the second joints become progressively longer as the end of the body is approached, whilst the sixth joints are correspondingly shorter. The superior border of the second joint is armed with six or more spines

First antennæ short, the basal joint stout, about twice as long as broad, with a distinct spinule on the inner distal angle; second joint slender, equal to the first in length; third joint one-third as long as the second, with the apex somewhat dilated; fourth joints and also the second antennæ wanting.

Mandibles stout, strongly bent in the middle; the molar tubercle and spine-row are well developed; cutting edge with three or more denticles.

The maxillipedes have large lanceolate epipods; the first two joints of the palp are subequal and as broad as long; third



Fourth leg.
Fig. 116b.

arranged in pairs; the third joint bears two pairs, one median and the other distal; the fourth joint has five or six spines arranged irregularly around the somewhat swollen distal extremity; fifth joint with four equidistant spines, of which the median pair is the largest; sixth joint without spines; seventh slender, tapering, and about four times as long as the diameter of the preceding joint.



Fifth leg.
Fig. 116c.

The second joints of the fifth to seventh pairs of legs are armed laterally and inferiorly with short conical spines. The length of the second joint of the fifth leg is about twice that of the seventh; the third joint equal in length to the two succeeding; sixth joint as long as the third; seventh one-fourth shorter than the sixth, slightly curved and truncated at the extremity.

The pleopods are of the usual form. The uropods are lanceolate in shape and bear two rows of submedian denticles.

One specimen of this remarkable species was found in the collection. Unfortunately the second antennæ are wanting. Notwithstanding this deficiency, the species appears to be sufficiently distinct to warrant its description as new.

It was obtained off Botany Bay in 50 to 52 fathoms.

ARCTURUS NODOSUS, sp. nov.

(Figs. 117a-d.)

Stations 35, 37.

Adult female:—Body 8 mm. in length. Frontal margin of cephalon slightly excavate; there are two erect spines on the upper surface, situated a little behind the transverse line of the eyes; other scattered spinules are present on the lateral margins. The first and fourth pereon segments each carry four slender equidistant spines; the second and third are furnished with six, the fifth, sixth and seventh with four.

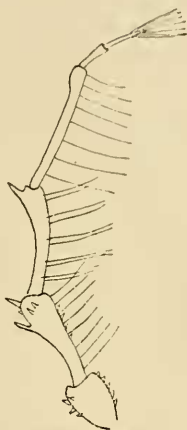
The caudal shield bears six paired spines; the subterminal pair is long and slender; all the spines are weak and easily bent or broken.

Cephalon as long as broad; first pereon segment short; second and third equal, twice as long as the first and about one-third longer than the fourth; fifth to seventh segments subequal, very

short in the mesial dorsal aspect. Pleon a little longer than the three preceding segments.

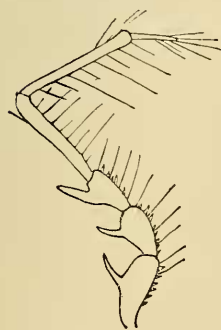
Eyes rather prominent, about twice as high as broad, with well defined blackish-brown ocelli.

First antennæ slender, extending to a short distance beyond the middle of the third joint of the second. Basal joint stout, twice as long as broad; second joint elongate, slender; third a little longer than broad; fourth about half as long as the second. Second antennæ about 2.5 mm. long, the first joint broader than long, armed with minute spinules; second joint three times as long as the first; it is evenly curved, with the superior border concave and the inferior convex, the distal half is swollen and bears a few spinules on the lower border and two strong spines on the upper; third joint longer than the second; it is curved throughout its length, dilated distally, and has a single spine at the superior angle; fourth joint longer than the third, slightly curved and somewhat thickened near its spineless extremity; fifth and sixth joints equal in length; the two combined are about half the length of the third. Mandibles straight with a well defined molar tubercle, a broad spine-row and a tridentate cutting edge.



Second antenna.

Fig. 117a.



Second leg.

Fig. 117b.

The third joint of the first pair of legs has a small spinule on the middle of the superior border: the seventh joint is but little curved and is shorter than the sixth.

Second joint of the second pair of legs more than three times as long as broad; lower border straight, armed with ten or twelve short, stout spinules; upper border curved, with a long spine in the middle. The third joint is a little longer than broad, much wider above than below, with three or four spinules on the inferior border and a long spine on the middle of the upper. Fourth joint longer than the third, twice as long as broad and apically dilated; the inferior border has three unequal spinules, and the upper terminates in a long spine. Fifth joint about one-third longer than the two preceding combined, armed on the inferior border with scattered spinules; the superior distal third is somewhat swollen. Sixth joint a little longer than the fifth, and per-

ceptibly thickened at the extremity. Seventh joint curved, tapering, about half the length of the sixth.

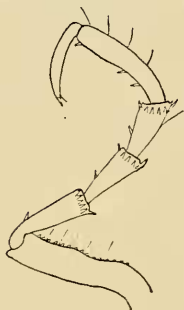
The second joint of the fourth pair of legs is nearly twice as long as the corresponding joint of the second; both the upper and lower borders are armed with a series of unequal spinules and five or six spines; some of the latter are equal to or exceed the transverse diameter of the joint; the third to the fifth joints are similar to those of the second pair of legs, but the spinules, spines and the distal thickenings are much more pronounced.

The second joint of the fifth pair of legs is about three times as long as broad, and of nearly equal width throughout; the superior border is minutely spinulose. The following three joints are successively one-third shorter; each has the basal portion slender, the apical part dilated and encircled with a subdistal series of stout setæ.

Sixth joint nearly as long as the second, slightly narrowed in its proximal third, with a few scattered setæ on the borders. Seventh joint stout, curved and equal to the third joint in length. The sixth and seventh pairs of legs are similar to the fifth, but slightly less in size. The pleopods are devoid of any special features. The uropods are furnished with a few stoutish spines and many small spinules.

This species is remarkable in having the third to the fifth joints of the outer antennæ and of all the legs, except the first, nodose at their distal extremities.

Four examples of this species were obtained off Botany Bay in 20 to 28 fathoms.



Fifth leg.
Fig. 117d.



Fourth leg.
Fig. 117c.

ARCTURUS SERRULATUS, sp. nov.

(Figs. 118a-c.)

Station 57.

Adult female:—Body 11 mm. long; the upper surface is ornamented with a series of spines and tubercles; these latter are disposed as follows:—The cephalon carries a pair of compressed spines on the front, immediately behind the truncated anterior

border; they arise from near the inner border of the eyes, and are slightly curved forward; each spine bears two or three spinules on the anterior border. The hinder portion of the cephalon is furnished with two erect and broadly conical tubercles; their bases are nearly in contact in the mesial line of the body; each tubercle is tipped with a small spinule.

The first peraeon segment bears two submedian tubercles, and four lateral spines, two of which are seated on the epimeral plates; the spines are compressed and abruptly bent above the middle, the apices being directed forward.

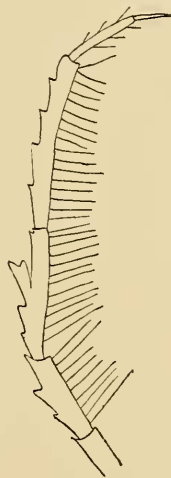
The second to the fourth segments have similar spines, but the submedian tubercles are wanting. In the three remaining segments the armature consists of conical, spine-tipped tubercles. The anterior portion of the pleon bears six sublateral tubercles; the first two pairs are erect; the last pair are very large, and directed obliquely outwards and downwards.

The lateral surfaces of the caudal shield bear numerous compressed spines or denticles; five or six are seriate, and larger than the rest, three of which are lateral and the others submarginal; a median spine is present at a short distance from the obtuse extremity. The uropods are each armed laterally with four compressed denticles.

Eyes black, round and rather prominent. Inner antennæ equal in length to the three basal joints of the outer; second joint one-third longer than the third; both are dilated and acute or spinose at their extremities; fourth joint stout, elongate; inferior border setiferous; the superior border bears two or three denticles near the distal extremity.

Outer antennæ one-sixth shorter than the body; first joint short; second one-fifth shorter than the third; fourth nearly twice as long as the second; fifth half the length of the third; sixth minute. The inferior borders of the second to the fourth joints are fringed with long setæ; the superior border bears ten denticles; of these three occur at equal distances apart on the second joint, and four are seated on the fourth; the third joint also bears three which are close together and confined to the proximal half of the joint; the distal denticle is large, and often has a spinule at its inner extremity.

First pair of legs stout; the second joint is equal in length to the sixth and also to the seventh; the third joint is longer than the fourth or fifth; the latter are equal, about as long as broad, and distally dilated; the fifth

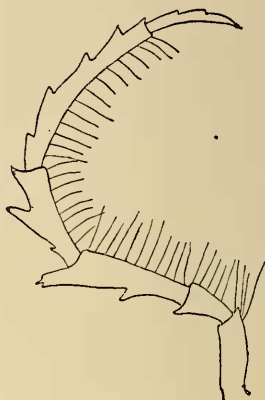


Second antennæ.

Fig. 118a.

joint bears a small spine at its superior extremity; inferiorly the sixth joint is excavated for the reception of the seventh when closed.

Second joints of the second to the fourth pairs of legs gradually increasing in length as the end of the peraeon is approached; each has a small denticle near the base on the superior margin; third joints subequal, that of the fourth leg with an acute denticle on the inferior distal angle; fourth joints decreasing in length from the second pair of legs to the fourth; each is armed with a superior distal spine; the fourth joints also have a spine on inferior border; fifth joints subequal, that of the second leg with three denticles on the superior border; the middle one of the three is often very large, and the proximal is small or sometimes absent; the third leg has two similar denticles, and the fourth



Second leg.

Fig. 118b.

bears one at the distal extremity; sixth and seventh joints of the second to the fourth pairs of legs gradually decreasing in length; the sixth bears four and the seventh three equidistant denticles on their superior borders. Second joints of the fifth and sixth pairs of legs equal, with four denticles, two proximal inferiorly and two distal on the superior border; second joint of the seventh pair of legs shorter than that of the sixth, with the marginal spines minute or absent. The third and fourth joints are subequal, each has a superior distal denticle, and the lower border of the fourth bears three spinules. Fifth joints short, equal, apically dilated and furnished with three spines on the lower border, the distal one being much the larger. Sixth joint more than two-thirds longer than wide, equal to or exceeding the seventh in length; the superior border bears two small denticles and the inferior four equidistant spines.



Fifth leg.

Fig. 118c.

The chief feature of this species is the armature of the limbs, which mainly take the form of saw-like teeth, and are very unlike the usual spinose processes found in many other species of the genus.

Two examples of this form were obtained off Wata Mooli, in 54-59 fathoms.